

## *Observations of Comets and Asteroids*

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### ***Strategy***

We use all available ground-based observational techniques to study the chemical and physical properties of the small bodies of the solar system, primarily comets and secondarily asteroids. The ultimate goal is to use these bodies to understand the formation and evolution of the solar system.

### ***Progress and Accomplishments***

- i) Published paper on a Pallas occultation of many years ago, handed over last of observational details on recent occultation of Vesta to Lebofsky and Millis for analysis, and assisted in a futile attempt (clouded out) to observe an occultation Vesta (3 Jan 1991).
- ii) Carried out simultaneous optical (ccd imaging) and millimeter (BIMA/FCRAO) observations of comet Austin to compare CN and HCN (collaborated with Palmer, Snyder, dePater, Schloerb). Insufficient sensitivity to see HCN structures with BIMA. Planned addition of 6 more antennas to BIMA will improve things. Also obtained images for OH to study spatial distribution. Published production rates in a timely manner for other observers but other results require additional analysis.
- iii) Observed comet Levy with IRTF and found very unusual broad-band colors. Analysis still in progress.
- iv) Observed broad-band IR colors at IRTF for all classical Saturnian satellites except Iapetus. Data still being processed.
- v) Reprocessed images for the Near Nucleus Net of the IHW archive. Previous processing had produced undesirable quantization effects because of use of integer arithmetic.
- vi) Collaborated with S.J. Bus in reducing and analyzing spectra of an outburst of Chiron. Reported detection of CN at largest distance, by a factor 2, for any comet.
- vii) Continued calculation of constraints on model of Halley's rotation using our ccd images of the jets.
- viii) Calculated models for the variability observed in comet Levy.
- ix) Continued analysis of data from long-term photometric program on comets.
- x) Collaborated with Tegler, Campins, Cochran in futile (bad weather) search for cometary activity associated with Hidalgo.

### ***Projected Accomplishments***

- i) Additional collaboration with Bus on interpretation of photometry of Chiron.
- ii) Publish paper on Halley's rotation (submit March 1991).
- iii) Observe nucleus of comet Faye to determine size, albedo, axial ratio, etc.
- iv) Complete analysis of 14-year narrow-band photometric program.
- v) Compare ccd images of various comets for correlation between presence of structures in coma with dynamical age.
- vi) Observe Ceres (UH 88-inch) to search for outgassing associated with ice reported by Lebofsky.

### ***Publications***

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- Dunham, D.W., et al. 1990. The Size and Shape of (2) Pallas from the 1983 Occultation of 1 Vulpeculae, *Astron.J.*, **99**, 1636-1662
- A'Hearn, M.F. 1991. Looking for Relationships, *Nature*, **347**, 715-716.
- A'Hearn, M.F. and M.C. Festou 1990. The Neutral Coma, Chapter 3 in *Physics and Chemistry of Comets in the Space Age*, ed. W. Huebner (Heidelberg, Germany: Springer-Verlag).
- Samarasinha, H. and M.F. A'Hearn, 1991. Observations and Dynamical Constraints on the Rotation of Comet P/Halley, submitted to *Icarus*.